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ABSTRACT

The Stages of Concern (SoC) Questionnaire was developed in order to measure the attitudes of individuals toward innovation. The Concerns Based Adoption Model provided the theoretical basis for the instrument. According to this model, individuals are first concerned with themselves, later with the details of the task, and finally with the impact of their own efforts. Recent longitudinal studies have demonstrated the validity of the SoC Questionnaire; two such studies are described in this report. In one study, urban elementary school teachers attending a workshop completed the SoC Questionnaire which measured their concerns about a new diagnostic reading program. In the other study, the Southwest Educational Development Lab used a prototype SoC Questionnaire to measure concerns about their preschool Thinking and Reasoning program. In both studies, the SoC Questionnaire indicated that persons having little experience with innovation had more awareness, informational and personal concerns than persons with greater experience. Those with greater exposure to innovation had more advanced levels of concerns about collaboration in use of the innovation, and about refocusing, or considering more effective alternatives. (MV)

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DEVELOPMENT AND VALIDATION OF A CONCERNS QUESTIONNAIRE

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DEVELOPMENT AND VALIDATION OF A CONCERNS QUESTIONNAIRE[1,2]

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The development and validation of a questionnaire are described. The questionnaire elicits information on the concerns of individuals involved in educational change. Seven scale scores reflect the individuals' concerns about any given innovation. Over 500 teachers and professors were involved in the development of the measure. Three separate studies which reflect on the validity of the instrument are described. Both the instrument and the variety of techniques used to investigate its validity should be of interest to researchers involved with educational change.

Previous Research on Concerns

Fuller (1969) proposed that the concerns of student teachers shift from one area to another in a systematic fashion as they progress through teacher training. She based this hypothesis on several studies of teacher anxieties

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[1]Paper presented at the annual meeting of the American Educational Research Association, New York, April 7, 1977.

[2]The research described herein was conducted under contract with the National Institute of Education. The opinions expressed are those of the author and do not necessarily reflect the position or policy of the National Institute of Education, and no endorsement by the National Institute of Education should be inferred.

(Travers, 1952; Thompson, 1963) and on personal experience with innovative teacher education programs (Fuller, Pilgrim, & Freeland, 1967).

Fuller noted that preservice teachers' concerns seemed to correspond to Maslow's (1954) hierarchy of needs. Early concerns were primarily security needs. Later, task-related and self-actualizing needs became more prominent. A three-stage model was developed in which Self, Task, and Impact concerns predominate sequentially during the teacher training sequence (Fuller, Parsons, & Watkins, 1973).

The developers of the Concerns-Based Adoption Model (Hall, Wallace, & Dossett, 1973) hypothesized that Fuller's developmental concept of concerns could be generalized to the innovation adoption process. The concept of "concerns" has been described as follows:

> The composite representation of the feelings, preoccupation, thought, and consideration given to a particular issue or task is called concern. Depending on our personal make-up, knowledge, and experiences, each person perceives and mentally contends with a given issue differently; thus there are different kinds of concerns. The issue may be interpreted as an outside threat to one's well-being, or it may be seen as rewarding. There may be an overwhelming feeling of confusion and lack of information about what "it" is. There may be ruminations about the effects. The demand to consider the issue may be self-imposed in the form of a goal or objective that we wish to reach, or the pressure that results in increased attention to the issue may be external. In response to the demand, our minds explore ways, means, potential barriers, possible actions, risks, and rewards in relation to the demand. All in all, the mental activity composed of questioning, analyzing, and re-analyzing, considering alternative actions and reactions, and anticipating consequences is concern. An aroused state of personal feelings and thought about a demand as it is perceived is concern.
>
> In working with individuals involved in change, staff at the UTR&D Center have found concerns about the change to be an important dimension of the process. In this research, the generic name given to the issue, object, problem, or challenge, the thing that is the focus of the concerns, is innovation. The innovation and its use provide a frame of reference from which concerns can be viewed and described.
>
> (Hall, George, & Rutherford, 1977, p. 5)

According to the Concerns-Based Adoption Model, anytime an individual encounters an innovation, his or her behavior is initially influenced mainly by concerns about his- or herself. As these self-concerns become resolved, the individual's concerns shift to focus on the details of the task. Ultimately, the individual becomes concerned about the impact of his or her efforts and strives to optimize his or her effectiveness.

Development of the SoC Questionnaire

The Stages of Concern instrument was developed in order to measure the concerns of individuals about an innovation. Seven Stages of Concern About the Innovation had been hypothesized in the Concerns-Based Adoption Model, as are listed in Table 1. These seven stages were systematically explored through a set of case studies and critiques by researchers and adoption agents. Formal instrument development procedures were initiated in December 1973. The goal was a quick scoring, pencil and paper questionnaire. Throughout the development process, data collection and analyses were planned with two criteria. First, indicators of the validity of the measure were continually assessed so that the ultimate product would measure the Stages of Concern with as much validity as possible. Second, the data were investigated in order to determine whether there might be more or fewer than seven Stages of Concern.

In February 1974, a sample of 300 elementary teachers and college professors were asked to express in writing their concerns about innovations being adopted at their institutions. All these items were then Q-sorted by ten judges according to the SoC definitions. Taking those items that six or more of the judges agreed on as being indicative of a particular SoC, a 195-item prototype measure using a seven-point Likert scale for each item was developed.

In April and May 1974, the 195-item prototype measure was completed by a sample of elementary school teachers in relation to the innovation of team

Table 1

Stages of Concern About the Innovation[3]

0 AWARENESS: Little concern about or involvement with the innovation is indicated.

1 INFORMATIONAL: A general awareness of the innovation and interest in learning more detail about it is indicated. The person seems to be unworried about himself/herself in relation to the innovation. She/he is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects, and requirements for use.

2 PERSONAL: Individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role with the innovation. This includes analysis of his/her role in relation to the reward structure of the organization, decision making and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected.

3 MANAGEMENT: Attention is focused on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are utmost.

4 CONSEQUENCE: Attention focuses on impact of the innovation on students in his/her immediate sphere of influence. The focus is on relevance of the innovation for students, evaluation of student outcomes, including performance and competencies, and changes needed to increase student outcomes.

5 COLLABORATION: The focus is on coordination and cooperation with others regarding use of the innovation.

6 REFOCUSING: The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. Individual has definite ideas about alternatives to the proposed or existing form of the innovation.

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[3]Original concept from Hall, G. E., Wallace, R. C., Jr., & Dossett, W. A. A developmental conceptualization of the adoption process within educational institutions. Austin: Research and Development Center for Teacher Education, The University of Texas, 1973.

teaching and college professors in relation to the innovation of instructional modules. The samples were stratified according to years of experience with the innovation, ranging from individuals never having used either teaming or modules, to those with five or more years of experience. The resultant data (N = 366) were then factor analyzed. Ten principal components factors were extracted. Three of these factors were unidentifiable because no items had primary loadings on them. The other seven factors were VARIMAX rotated.

A comparison of the hypothesized scales with the obtained factor structure revealed surprisingly high congruence. Stages of Concern scores calculated by summing each person's responses on the items for each scale can be correlated with factor scores computed on the basis of the VARIMAX rotated factor structure. A program developed these correlations, which are summarized in Table 2. This matrix shows that VARIMAX factor 7 corresponds to the SoC scale for Stage 0, factor 1 corresponds to Stage 1, etc. This analysis led project members to infer that the seven scales tapped seven independent constructs which could be identified readily with the seven Stages of Concern proposed in the Concerns-Based Adoption Model.

Each item, it should be noted, was responded to on a zero through seven scale, a seven response indicating that the person considered that item to be "very true of me now" and a zero "not true of me now." Scores were computed by adding the responses for the items in each scale; the sum of the scale scores constituted the total score. This correlational evidence indicated that the items on a particular scale tended to be responded to similarly, the inference being that the items in each scale measured a notion distinct from notions measured by other scales.

Teachers and professors with varying amounts of experience with an innovation, in reflecting about their concerns, "sorted" the items into clusters which corresponded to the concern stages without their having known about concerns theory. Thus, initially at least, the idea of there being identifiable

Table 2

Correlations Between VARIMAX Factor Scores and Scale Scores on the Pilot Stages of Concern Questionnaire -- Analysis of 150 Items, 363 Respondents

		VARIMAX Factor Scores						
		7	1	6	3	4	2	5
SoC Scale Scores	0	.83	-.36	.41	.04	.05	-.04	-.09
	1	.46	.67	-.40	-.10	.22	-.35	.01
	2	-.14	.49	.72	.36	.04	-.14	.26
	3	.10	-.04	-.34	.91	.10	.12	-.12
	4	-.14	-.19	.00	.12	.96	-.02	-.07
	5	.10	.37	.11	-.11	.11	.82	-.34
	6	.16	-.05	-.17	-.02	.07	.40	.88

clusters (factors) of concerns seemed to have a quantitative basis. The 35-item Stages of Concern Questionnaire was then constructed by selecting from among the strongest items (factor loadings greater than 0.5) representing each of the rotated factors.

Reliability of the SoC Questionnaire

The items representing each stage on the questionnaire were thus selected in such a manner that high internal reliability was very likely. In the Fall of 1974, a large sample (N = 830) of teachers and professors expressed their concerns about the innovations of team teaching and instructional modules. The 35-item SoC Questionnaire was used, and item analyses were conducted. Table 3 shows the alpha coefficients of internal consistency for each of the seven Stage of Concern scales. These coefficients reflect the degree of reliability among items on a scale in terms of overlapping variance. The formula is a generalization of the Kuder-Richardson Formula 20 for dichotomous items (see Cronbach, 1951). Program TESTAT on the VSTAT library was used to compute these coefficients (Veldman, 1967).

Table 3

Coefficients of Internal Reliability for the Stages of Concern Questionnaire, N = 830

Stage	0	1	2	3	4	5	6
Alphas	.64	.78	.83	.75	.76	.82	.71

A subsample of 171 teachers were asked to complete the SoC Questionnaire a second time, two weeks after their initial completion of the instrument. Most of these teachers (N = 132) completed and mailed in this "retest" data. Test-retest correlations were omputed and are shown in Table 4.

Table 4

Test-Retest Correlations on the Stages of Concern Questionnaire, N = 132

Stage	0	1	2	3	4	5	6
Pearson-r	.65	.86	.82	.81	.76	.84	.71

Validity of the SoC Questionnaire

These indicators of measurement stability reflect the reliability of the scores obtained on the questionnaire. The validity of the scores as measures of concerns (as we conceptualize concerns) could not be demonstrated as easily. There does not exist another measure of concerns with which we could easily compare our measure. Following Cronbach and Meehl (1955), we have endeavored to demonstrate that scores on the questionnaire relate to each other and to other variables exactly as we would expect concerns to be related. Thus, inter-correlation matrices, judgments of concerns based on interview data, and confirmation of expected group differences and changes over time have been used to investigate the validity of the SoC scores.

The first indications that the questionnaire did measure concerns as we conceptualize them came with the analyses of the 195-item pilot questionnaire (May 1974). This prototype instrument contained six subscales (stage 1 through

Stage 6). Each stage consisted of between 14 and 68 items (which had been Q-sorted by the staff into those stages). Evidence for the validity of these stages as separate constructs which were related in a developmental way comes from two analyses. On June 20, 1974, an analysis of the data from 359 persons who had completed the 195-item questionnaire indicated that 83% of the items correlated more highly with the stage that had been assigned than with the total score on the instrument. Indeed, 72% correlated more highly with the stage they had been assigned to than with any other stage.

On June 25, 1974, a correlation matrix was computed based on this same data. Table 5 shows how the scales (each measuring one stage) intercorrelate.

Table 5

Intercorrelation of 195-Item
Stages of Concern Questionnaire Scale Scores

		Stages					
		1	2	3	4	5	6
Stages	1	1.0	.68	.47	.21	.21	.19
	2		1.0	.78	.43	.37	.43
	3			1.0	.60	.51	.59
	4				1.0	.82	.80
	5					1.0	.77
	6						1.0

The correlations near the diagonal are higher than those more removed from it. Guttman (1954, 1956) has applied the term simplex to this type of pattern. The simplex pattern in a matrix corresponds to a set of objects having degrees of similarity and dissimilarity with one another in such a way that they can be arranged on a line. Each object will be more like an object immediately beside it than like any other farther away on the line. Thus, the scales on the pilot questionnaire indicated an order consistent with the hypothesized order of the Stages of Concern.

Then, we looked at the 35-item questionnaire data collected in the Fall of 1974. The scores on each Stage of Concern were converted to percentiles and sorted according to highest percentile. A composite Stages of Concern profile could be examined which represents the average percentiles on each Stage of Concern for all individuals who peaked on a given Stage. These profiles are presented in Table 6. As a general rule, the scores on stages adjacent to the highest concern are higher than those further removed. This is further evidence that the Stages of Concern, as measured by the questionnaire, may be developmental.

Table 6

Average Stage of Concern Percentile Scores
Sorted by Highest Stage of Concern (Fall 1974 data)

		Average Percentile Scores							
		0	1	2	3	4	5	6	Total
High SoC	0	81	59	56	44	29	28	27	44
	1	64	87	75	51	51	53	38	69
	2	63	80	89	62	52	52	44	75
	3	53	60	65	87	53	48	55	69
	4	28	32	35	39	78	56	47	43
	5	29	45	39	38	59	88	48	51
	6	42	51	52	44	68	58	85	64

A rigorous validity study was conducted in August and September 1976. The research focus in this effort was expressed as follows: How accurate are inferences about a person's concerns about an innovation likely to be when these inferences are based on the SoC Questionnaire data? In order to answer this question, staff members first assessed a person's concerns by listening to taped interviews. Each person's concerns were estimated, then the actual SoC scores were examined. This procedure enabled the investigators to provide quantitative ratings on the person's concerns prior to exposure to SoC scores. Pilot studies

had shown that when the investigator is exposed to SoC scores prior to assessing concerns in some other manner, a typical reaction had been that the scores did reflect the person's concerns, but these scores may have been misinterpreted. It was then impossible to assign quantitative concerns scores on the basis of the alternate measure without bias due to exposure to the SoC scores.

The analyses reported here deal with the following quantitative data:

1. Investigators' ratings of SoC based on a taped interview. The highest perceived concern was indicated along with one or two "also high" concerns. The remaining four or five stages were, by implication, of lower concern.
2. A self-report rating of the difficulty the investigator had in assessing these concerns from the LoU Interview.
3. Subjective rating of "to what extent does the profile reflect your assessment of the person?"
4. Subjective rating of "how adequately does the high stage score on the profile reflect the person's concerns?"
5. SoC raw stage scores (7 plus total).
6. SoC percentile stage scores (7 plus total).

Three staff members provided data on 28 persons selected at random from a group of several hundred teachers who completed the SoC Questionnaire in the Spring of 1976.

The first analysis investigated the reliability of the investigator's ratings of concerns, difficulty, and assessments of profile and high score accuracy. In general, reliabilities were moderate to high. (See Table 7.) Ratings of the "highest" and "also high" concerns showed group reliabilities between .42 and .85. Six of the seven were above .58 ($p < .01$). Only Stage 3 showed a nonsignificant reliability (.42, $p = .06$). These were very encouraging findings, because pilot attempts at assessing concerns from interviews had provided less reliable data.

Table 7

Reliability of Ratings in Validity Study Analysis

Variable	Reliability	p
Ratings of SoC Based on Interview Data:		
Stage 0	.59	<.01
Stage 1	.85	<.01
Stage 2	.60	<.01
Stage 3	.42	.06
Stage 4	.71	<.01
Stage 5	.73	<.01
Stage 6	.67	<.01
Rating Difficulty	.37	.10
Satisfaction with Congruence of Estimated and Obtained SoC	.27	.14
Satisfaction with Highest SoC as Sole Representation of Concerns	.09	.39

Ratings of the difficulty of assigning SoC scores on the basis of the interview were less reliable (.37, p = .10). This rating and the rating of the congruence of the SoC scores and perceived concerns (.27, p = .18) were rated differently by the three investigators on these persons. Assessment of congruence may be unreliable simply because the investigators had varying degrees of satisfaction over the accuracy of the SoC profile.

Assessed degree of satisfaction with the high score as representative of the persons' concerns was the least reliable datum (.09, p = .39).

Table 8 shows the correlations between the investigators' ratings and the rank ordering of the SoC percentile scores. Ideally, high diagonal correlations would be obtained. Indications are that Stage 5 is the "cleanest" (r = .54). Stages 1 and 2 show high diagonal correlations, but also correlate with each other off the diagonal. Stages 0, 3, and 6 are marginally clean, while Stage 4 failed to correlate on the diagonal at all (r = .13). Six out of seven

Table 8

Correlation of Peak Stage Estimates
and Rank Order of SoC Percentile Scores

		Peak SoC						
		0	1	2	3	4	5	6
Quantitative Ratings	0	.27	.34	-.11	.02	.22	.22	-.13
	1	.15	.47	.47	-.09	-.11	-.50	-.45
	2	.03	.38	.42	-.21	-.10	-.24	-.34
	3	-.25	-.08	.00	.30	-.04	.02	.09
	4	-.05	-.22	-.26	-.01	.13	.08	.33
	5	-.20	-.48	-.20	-.03	.31	.54	.16
	6	-.20	-.20	.16	-.15	.24	.17	.31

N = 65 critical r = .25 $p \leq .05$ —
r = .32 $p \leq .01$ ═

significant correlations on the diagonal was very encouraging. Only 11 of the 42 off-diagonal elements were significant, and half of these significant correlations were negative (5/11). It can be concluded that, except for Stage 4, validity of the SoC is supported in this matrix.

Perhaps the most convincing demonstrations of the validity of the Stages of Concern Questionnaire have come in the course of its use over the last two years in longitudinal studies. Two cases in which the SoC scores dramatically reflected changes in concerns which had been predicted by the concerns theory are presented here.

The faculties of two elementary schools in an urban school district were invited to participate in a summer workshop where they would help develop and learn how to use a new approach to reading instruction. The new approach, which was to replace a traditional Basal reader program, might best be described as a diagnostic-prescriptive program. It called for teachers to begin by assessing student needs, followed by the establishment of specific instructional objectives, appropriate instruction, and finally careful evaluation of pupil mastery

of the stated objective. Although the new approach continued to utilize Basal readers, they were used, or supposedly used, in very different ways. In fact, the new program required a very different way of teaching reading.

As it turned out, approximately half (N = 22) of the faculty members were able (and willing) to attend the five-week summer workshop. To accommodate those who were not in the workshop (N = 25), a one-day workshop was set up just prior to the opening of school in the fall to explain the new program and its implications for them. On that same day in a separate location, the workshop participants were meeting for a different purpose. As the first activity of the day, both groups were asked to complete the Stages of Concern Questionnaire which measured their concerns about the new reading program. SoC profiles are shown in Figure 1.

Persons who had not attended the workshop indicated higher concerns on Stages 0, 1, 2, and 4 ($p < .01$ in each comparison). There were no significant differences between the groups on Stages 3, 5, and 6. Assuming that the groups were the same except for workshop attendance, it can be inferred that the workshop lowered the teachers' Awareness, Informational, and Personal concerns (Stages 0, 1, and 2). In addition, concerns about the effects of the innovation on students (Stage 4) were lowered by the workshop. We would expect that concerns about Collaboration and Refocusing (Stages 5 and 6) would increase after the teachers had some experience using the innovation. No follow-up data was collected, however.

In another study, the Southwest Educational Development Lab used a prototype concerns questionnaire to measure concerns about their preschool Thinking and Reasoning program. Preworkshop, Postworkshop, and Follow-up concerns assessments revealed the type of shift in concerns illustrated in Figure 2. Scores on the lower stages (0, 1, 2, and 3) dropped with each assessment. Scores on the higher stages (5 and 6) rose with each assessment. Scores on

Figure 1

Concerns Profiles for Workshop and Nonworkshop Groups

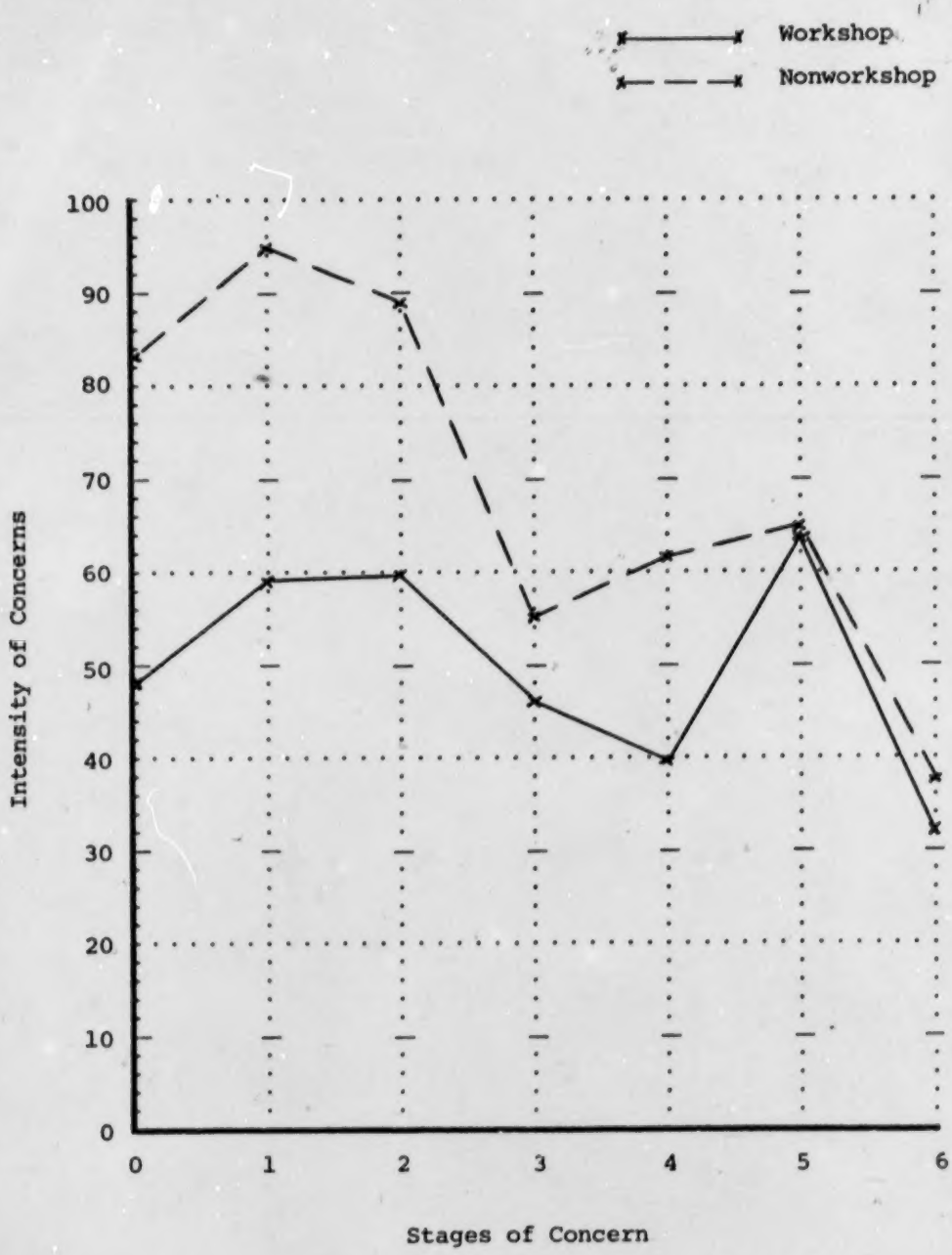
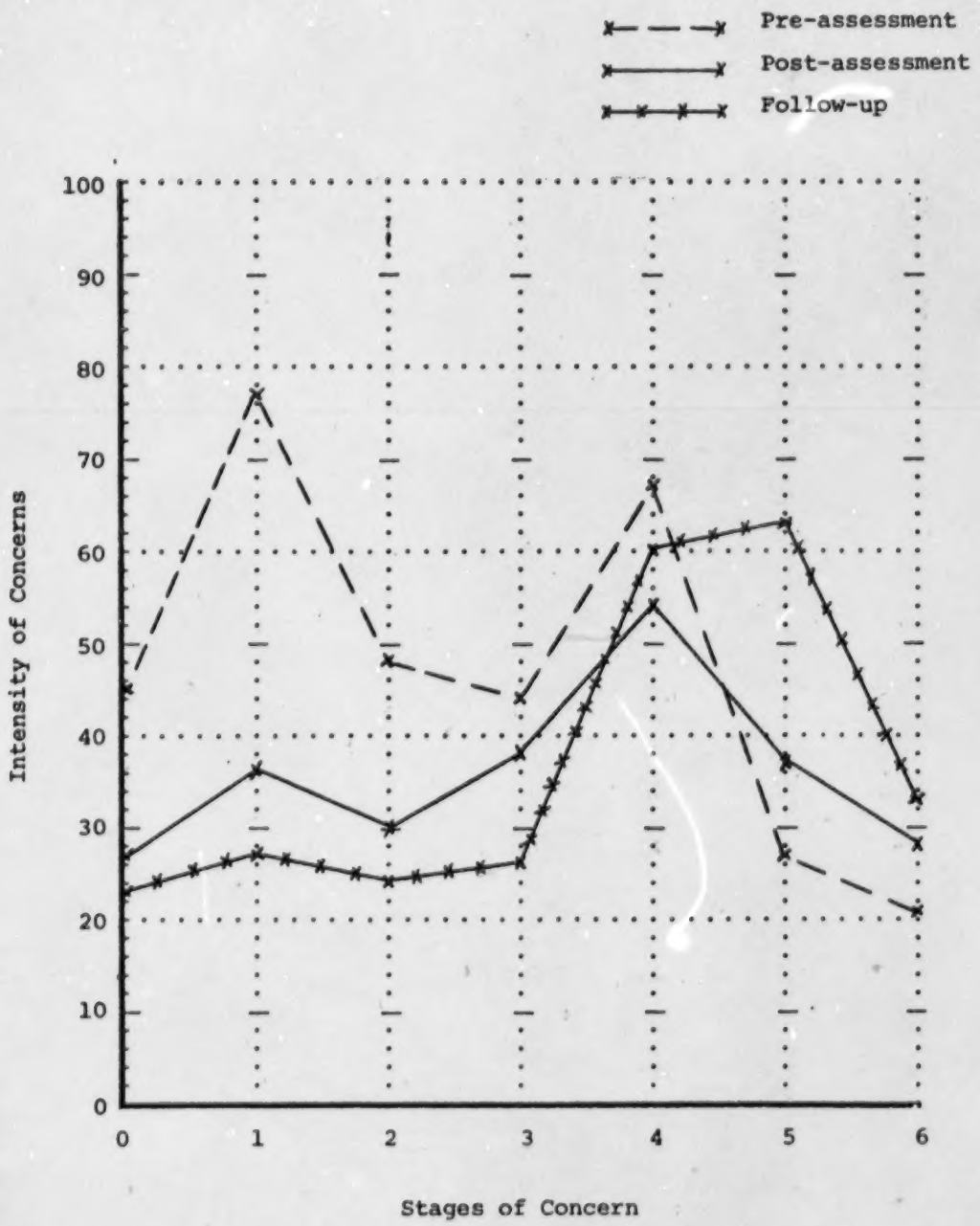


Figure 2

Concerns About a Preschool Thinking and Reasoning Program
Assessed at Three Points in Time



Stage 4 were highest before the workshop, lowest after the workshop, and at an intermediate level on follow-up.

In each of these studies, the SoC Questionnaire indicated that persons with little experience with an innovation had more Awareness, Informational, and Personal concerns than persons with greater experience. The SoC Questionnaire also indicated that persons with some experience with an innovation had higher concerns about Collaboration and Refocusing than those without experience. Concerns about Management and Consequence of the innovation were not as related to experience as the other stages. These findings indicate that the Stages of Concern Questionnaire very probably is measuring concerns about the innovation as we have defined them.

Summary and Conclusions

The Concerns-Based Adoption Model was developed to explain the innovation adoption process. The concept of concerns of teachers, as developed by Frances Fuller, was applied to the concerns of teachers about educational change. Seven Stages of Concern were hypothesized. A psychometric questionnaire was developed to measure these seven concerns. The data presented here have led researchers at the Research and Development Center for Teacher Education to feel confident that the Stages of Concern Questionnaire is a reliable and valid measure of these concerns of teachers. The instrument should prove to be a valuable tool in the study of educational change. Administrative personnel should also find the SoCQ to be useful in facilitating change.

References

Cronbach, L. J. Coefficient alpha and the internal structure of tests. Psychometrika, 1951, 16, 297-334.

Cronbach, L. J., & Meehl, P. E. Construct validity and the psychological testing. Psychological Bulletin, 1955, 52(4), 281-302.

Fuller, F. F. Concerns of teachers: A developmental conceptualization. American Educational Research Journal, 1969, 6(2), 207-226.

Fuller, F. F., Parsons, J. S., & Watkins, J. Concerns of teachers: Research and reconceptualization. Austin: Research and Development Center for Teacher Education, the University of Texas, 1973. (ERIC Document Reproduction Service Number ED 091 439)

Fuller, F. F., Pilgrim, G. H., & Freeland, A. M. Intensive individualization of teacher preparation. In Mental Health and Teacher Education. Taylor, B. L. (Ed.), 46th Yearbook of the Association for Student Teaching. Dubuque, Iowa: Wm. C. Brown, 1967, 151-187.

Guttman, L. A new approach to factor analysis: The radix. In P. F. Larazsfeld (Ed.), Mathematical thinking in the social sciences. New York: Free Press, 1954.

Guttman, L. Empirical verification of the radix structure of mental abilities and personality traits. Educational and Psychological Measurement, 1957, 17, 391-407.

Hall, G. E., George, A. A., & Rutherford, W. L. Measuring Stages of Concern About the Innovation: A manual for use of the SoC Questionnaire. Austin, Texas: Research and Development Center for Teacher Education, the University of Texas, 1977.

Hall, G. E., Wallace, R. C., Jr., & Dossett, W. A. A developmental conceptualization of the adoption process within educational institutions. Austin, Texas: Research and Development Center for Teacher Education, the University of Texas, 1973.

Maslow, A. Motivation and personality. New York: Harper, 1954.

Thompson, M. L. Identifying anxieties experienced by student teachers. Journal of Teacher Education, 1963, 14, 435-439.

Travers, R. M. W., Rabinowitz, W., & Nemovicher, E. The anxieties of a group of student teachers. Educational Administration and Supervision, 1952, 38, 368-375.

Veldman, D. J. Fortran programming for the behavioral sciences. New York: Holt, Rinehart and Winston, Inc., 1967.